# PROFESSOR McDOUGALL'S LAMARCKIAN EXPERIMENT

## By M. S. PEASE

THE third instalment of Professor McDougall's Lamarckian experiment on rats is of quite unusual interest by reason of the new data on adverse selection now published.* It will be remembered that in this experiment, which has now been in progress since 1920, Wistar rats are dropped into a tank of water from which there are two exits, one brightly, the other dimly, illuminated; the bright platform is so wired that a rat emerging on to it from the water gets an electric shock—the dim platform is the safe exit. Professor McDougall and Mr. Rhine have trained and bred these rats, generation by generation, to avoid the electrified platform; the figures given for the average number of errors made per rat has clearly diminished from over 120 per rat in the control stocks (p. 222, Table III) to 33 per rat of the trained stock from the twenty-fourth to the thirty-fourth generation (p. 219, Table II). If we compare the figures for the thirteenth to the twenty-third generation of rats with those for the twenty-fourth to the thirty-fourth generation, it is clear that they show an increase in the facility to escape by the safe passage; it is by no means clear, however, that any substantial progress has been made in the last part of the experiment, that is to say from the twenty-fourth to the thirty-fourth generation.

By far the most interesting new data published concerns adverse selection. Thirteen generations of Wistar control rats were bred from the parents in each generation which had shown the worst performance. If the increased facility observed in the experimental animals had been due to unintentional selection of cleverer rats, then the intentional selection of stupider rats should show an increase in the number of errors observed from generation to generation. No such effect was found; the adversely selected controls, like the unselected experimentals, continued to improve. The figures published (Table IV, p. 224) do not show a steady improvement—it is irregular from generation to generation. But taking the table as a whole, undoubtedly improved facility is indicated.

The authors have no doubt that we are here witnessing at work a Lamarckian process. But of this Professor McDougall and Mr. Rhine are in a far better position to judge than are the readers of the published results, by reason of the persistent omission to give the relevant breeding-data on which a geneticist would base his judgment. Throughout we are given only figures of average errors for each generation of rats. It is true that the best and the worst rats of each generation are usually noted; but even this figure would appear to be not an individual performance, but only a batch average (comment on top of p. 226). But from a breeder's point of view, what makes judgment difficult, if not impossible, is the absence of any pedigree tables. The authors must surely realize that the issue which this experiment raises is a fundamental one; for the spectators it is tantalizing to have withheld just the detailed breeding data which might enable a critical judgment to be made. Unless we are given the performances individually of parents and offspring at each stage, it is futile to speculate on the process at work.

The absence of the breeding details is all the more to be regretted, as the authors seem to be well on their guard against the pitfalls of such experimentation. Now and again, however, they betray unexpected lack of critical caution. In 1932 new tanks were

* J. B. Rhine and William McDougall: *British Journal of Psychology* (General Section), Vol. XXIV, p. 213, 1933.

used—they were practically similar to the original tanks; yet we are told that the rats found the old tanks 54 per cent. more difficult than the new ones. (This figure is arrived at by comparing the average performances of fifty-eight and sixty-three "equivalent" rats in the two baths.) This is surely a most disturbing figure. For it shows that performance is extremely "highly geared" to environment, or at any rate to tank environment. If apparently quite trivial differences between the two tanks "cause" a 54 per cent. shift in the performance results, what significance should we attach to observed performance differences of 20 per cent. or 30 per cent. or even 50 per cent.? May not the changes observed in the number of errors made be due to changes in the environment unnoticed over ten years of experimentation? Are we not face to face with the basic question as to whether the design of the experiment is not too coarse to register differences in the aptitude of rats to learn? To some extent these questions could be answered if we had before us the individual records of the rats and their pedigrees; we could then form some judgment of the variability of the material and of the degree of inheritance. Professor McDougall and Mr. Rhine are content to add 54 per cent. to the errors in the new tank, in order to make comparison with the old tank results.

Mention should be made of Table VI on p. 232. The numbers here given are indeed small, as the authors point out; but as far as the figures go, they are entirely subversive. We have already drawn attention to the adversely selected rats: in Table VI are set out figures showing the converse experiment, intentionally favourable selection. For seven generations rats were trained, each succeeding generation being bred only from the most successful trainees. The average number of errors made per rat in the first three generations was sixty-five: in the last three generations 101. Professor McDougall and Mr. Rhine comment that the figures go to illustrate the comparative small influence of such selection. Surely they equally illustrate the comparative small influence of such training?

Fortunately Professor McDougall's experiments do not stand alone. We are able to compare them with results obtained by Professor Crew in a repetition of the experiment.* It is true that Professor Crew's tank is not identical with Professor McDougall's; and from what has gone before, it is obvious that we should avoid making a direct comparison between the performance of the rats in Professor Crew's tank with that of the rats in Professor McDougall's tank. But Professor Crew's contraption is so similar to Professor McDougall's that similar effects of training should become clear in the new experiment, especially since both used Wistar rats. But in fact no such improvement in performance was recorded after six generations of training; there was no significant difference between the generations of trained rats or between these and the control rats. Extraordinarily wide differences were found between the individual performances of the rats: but selective breeding showed performance to be to some extent an inherited characteristic. Professor Crew tentatively suggests that what is in question is not so much different aptitudes to learn, but rather different types of behaviour.

Be that as it may, the fact remains that an attempt to repeat Professor McDougall's experiment has failed. Until a successful repetition is carried out, it would be wise to suspend judgment. In the meantime Professor McDougall and Mr. Rhine would be well advised to publish in full the pedigree tables and, as far as they can, the individual performances of the rats; or better still, to invite the collaboration of a trained geneticist.

* Proceedings of the sixth international Congress of Genetics, p. 121, and British Association Report, 1933.